


PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P0788	FOR FURTHER ACTION See Form PCT/PEA/416	
International application No. PCT/GB2004/000178	International filing date (day/month/year) 16.01.2004	Priority date (day/month/year) 18.01.2003
International Patent Classification (IPC) or national classification and IPC G05D23/19		
Applicant CERAMASPEED LIMITED ET AL.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand 13.08.2004	Date of completion of this report 08.04.2005	
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Philippot, B Telephone No. +31 70 340-2822	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/000178

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item:
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

4-6, 8-13 as originally filed
1-3, 7 filed with the demand

Claims, Numbers

1-42 filed with the demand

Drawings, Sheets

1/3-3/3 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/000178

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-42
	No: Claims	
Inventive step (IS)	Yes: Claims	1-42
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-42
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following document:

D1: US-A-6 121 587 (EMTMANN SILVIA ET AL) 19 September 2000 (2000-09-19)

1) industrial Applicability :

The invention deals with an electric heater. Its industrial applicability is obvious.

2) Novelty :

Document D1, which is considered to represent the most relevant state of the art, discloses an electric heater from which the subject-matter of claim 1 differs in that the first and second terminal regions respectively of the at least one electric heating element are electrically connected to the first electrically conductive element and the second electrically conductive element.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

3) inventive Step:

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The problem to be solved by the present invention may be regarded as to provide an electric heater which provides electrical connections between the temperature-limiting device and the heating element which are easier to assemble.

There is no suggestion, neither in D1, nor in the other documents of the prior art at hand, that, to improve the connections between the heating elements and the temperature-limiting device, the terminal regions of the heating elements would be attached to electrical conductive elements provided on the side of the housing of the temperature-limiting device.

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(SEPARATE SHEET)**

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4) Dependent Claims :

Claims 2-42 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

- 1 -

ELECTRIC HEATER

This invention relates to an electric heater provided with the temperature-limiting device, for example an electric heater for use in a cooking appliance.

It is well known to provide a temperature-limiting device for an electric heater. Such an electric heater is typically arranged for location behind a surface to be heated, such as a glass-ceramic cooking surface, and generally comprises a dish-like support having therein at least one electric heating element. In particular, the temperature-limiting device comprises thermally responsive bimetallic means provided in a housing and supported on the heater in such a way as to respond, at a particular temperature of the heater, to operate one or more switch means located in the housing.

It is necessary to electrically connect a voltage source to the heating element or elements and to arrange for the temperature-limiting device to operate to interrupt the voltage supply when a predetermined temperature is reached.

It is known to provide a terminal block externally on the dish-like support of the heater. Such terminal block is connected to terminal regions of the heating element or elements and external leads are arranged from the terminal block to the voltage source and to the temperature-limiting device. Such an arrangement is inconvenient and expensive to implement.

It is also known to provide direct electrical connection between terminal regions of a heating element and connecting elements on a temperature-limiting device,

such connecting elements being accessible in the region of a front face of a housing of the temperature-limiting device adjacent to the heater. In this known arrangement, the temperature-limiting device comprises a
5 differentially-expanding rod and tube assembly, which extends at least partly across the heater from the housing and operates one or more switch means located in the housing.

10 It is therefore an object of the present invention to overcome or at least ameliorate the disadvantages of the above arrangements.

According to the present invention there is provided an
15 electric heater adapted for location behind a surface to be heated and comprising a dish-like support having therein at least one electric heating element having a first terminal region and a second terminal region, and a temperature-limiting device having a thermally responsive
20 bimetallic means provided in a housing, the housing being adapted to be supported at a peripheral region of the heater, at least partially externally of the dish-like support, the thermally responsive bimetallic means being adapted to be thermally coupled with the heater to sense
25 heat generated therein by the at least one heating element and to respond at a predetermined temperature to operate at least one switch means located in the housing, the housing having a first side and a second side opposite to each other provided with a first electrically
30 conductive element and a second electrically conductive element accessible at the sides of the housing, externally of the dish-like support, characterised in that the first and second terminal regions respectively

of the at least one electric heating element are electrically connected to the first electrically conductive element and the second electrically conductive element.

5

The electrical connection of the first and second electrically conductive elements to the respective first and second terminal regions of the at least one heating element may be by means of direct contact between the
10 electrically conductive elements and the terminal regions.

The first and second terminal regions of the at least one heating element may extend through apertures in the dish-
15 like support for electrical connection to the first and second electrically conductive elements.

The first and second terminal regions of the at least one heating element may be electrically connected to the
20 first and second electrically conductive elements by welding.

At least one of the first and second electrically conductive elements may be provided with a portion
25 selected from a strip-like portion and a flanged portion for securing to at least one of the first and second terminal regions of the at least one heating element.

The strip-like portion may have a plane thereof disposed
30 in any desired orientation from a vertical plane to a horizontal plane.

The flanged portion may have a wall portion with a dependant laterally-directed ledge portion.

Alternatively, the bimetallic means may comprise a member, such as of strip form, which undergoes increasing deflection with increasing temperature and operates to
5 cause displacement of electric contacts of the at least one switch means at a predetermined temperature. Such electric contacts may be incorporated in a snap switch arrangement.

10 For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

15 Figure 1 is a plan view of an arrangement of part of an electric heater according to the present invention provided with an embodiment of a temperature-limiting device;

20 Figure 2 is a plan view of a modification of the arrangement of Figure 1; and

Figure 3 is a plan view of an arrangement of part of an electric heater according to the present invention
25 provided with an alternative embodiment of a temperature-limiting device.

Referring to Figure 1, an electric heater 2 is arranged for location beneath a surface 4 to be heated. The
30 surface 4 may be a cooking surface and may comprise glass-ceramic material.

CLAIMS

1. An electric heater (2) adapted for location behind a surface (4) to be heated and comprising a dish-like support (6) having therein at least one electric heating element (12) having a first terminal region (12A) and a second terminal region (12B), and a temperature-limiting device (14) having a thermally responsive bimetallic means (22) provided in a housing (16), the housing (16) being adapted to be supported at a peripheral region of the heater (2), at least partially externally of the dish-like support (6), the thermally responsive bimetallic means (22) being adapted to be thermally coupled with the heater (2) to sense heat generated therein by the at least one heating element (12) and to respond at a predetermined temperature to operate at least one switch means (18) located in the housing (16), the housing (16) having a first side (32) and a second side (38) opposite to each other provided with a first electrically conductive element (34) and a second electrically conductive element (40) accessible at the sides (32, 38) of the housing (16), externally of the dish-like support (6), characterised in that the first and second terminal regions (12A, 12B) respectively of the at least one electric heating element (12) are electrically connected to the first electrically conductive element (34) and the second electrically conductive element (40).
2. An electric heater as claimed in claim 1, characterised in that electrical connection of the first and second electrically conductive elements (34, 40) to the respective first and second terminal regions (12A, 12B) of the at least one heating element (12) is by means

of direct contact between the electrically conductive elements (34, 40) and the terminal regions (12A, 12B).

3. An electric heater as claimed in claim 1 or 2,
5 characterised in that the first and second terminal regions (12A, 12B) of the at least one heating element (12) extend through apertures (48, 50) in the dish-like support (6) for electrical connection to the first and second electrically conductive elements (34, 40).

10 4. An electric heater as claimed in any preceding claim, characterised in that the first and second terminal regions (12A, 12B) of the at least one heating element (12) are electrically connected to the first and
15 second electrically conductive elements (34, 40) by welding.

5. An electric heater as claimed in any preceding claim, characterised in that at least one of the first
20 and second electrically conductive elements (34, 40) is provided with a portion (36, 42) selected from a strip-like portion and a flanged portion for securing to at least one of the first and second terminal regions (12A, 12B) of the at least one heating element (12).

25 6. An electric heater as claimed in claim 5, characterised in that the strip-like portion has a plane thereof disposed in any desired orientation from a vertical plane to a horizontal plane.

30 7. An electric heater as claimed in claim 5, characterised in that the flanged portion has a wall portion with a dependant laterally-directed ledge portion (36A, 42A).

8. An electric heater as claimed in any one of claims 5 to 7, characterised in that at least one of the first and second electrically conductive elements (34, 40) has the portion (36, 42) extending in a direction towards the heater (2) and at a predetermined angle relative to a rim of the dish-like support (6).

9. An electric heater as claimed in claim 1, characterised in that one of the first and second electrically conductive elements (34, 40) is arranged for electrical connection to a terminal region selected from the respective first and second terminal regions (12A, 12B) of the at least one heating element (12) by way of at least one electrically conductive link (52).

10. An electric heater as claimed in claim 1, characterised in that both of the first and second electrically conductive elements (34, 40) are arranged for electrical connection to the respective first and second terminal regions (12A, 12B) of the at least one heating element (12) by way of at least one electrically conductive link (52).

11. An electric heater as claimed in claim 9 or 10, characterised in that the at least one electrically conductive link (52) is of a form selected from wire and strip form.

12. An electric heater as claimed in claim 9, 10 or 11, characterised in that the at least one electrically conductive link (52) extends through apertures (48, 50) in the dish-like support (6) for electrical connection to the first and second electrically conductive elements (34, 40).

13. An electric heater as claimed in any one of claims 9 to 12, characterised in that the at least one electrically conductive link (52) is electrically connected to the first and second electrically conductive elements (34, 40) by welding.

14. An electric heater as claimed in any one of claims 9 to 13, characterised in that at least one of the first and second electrically conductive elements (34, 40) is provided with a portion (36, 42) selected from a strip-like portion and a flanged portion for securing to the at least one electrically conductive link (52).

15. An electric heater as claimed in claim 14 characterised in that the strip-like portion has a plane thereof disposed in any desired orientation from a vertical plane to a horizontal plane.

16. An electric heater as claimed in claim 13, characterised in that the flanged portion has a wall portion with a dependant laterally-directed ledge portion (36A, 42A).

17. An electric heater as claimed in any one of claims 9 to 16, characterised in that at least one of the first and second electrically conductive elements (34, 40) has the portion (36, 42) extending in a direction towards the heater (2) and at a predetermined angle relative to a rim of the dish-like support (6).

18. An electric heater as claimed in any preceding claim, characterised in that the first and second electrically conductive elements (34, 40) extend laterally at the first and second opposite sides (32, 38) of the housing (16).

19. An electric heater as claimed in any preceding claim, characterised in that the at least one electric heating element is of corrugated ribbon form (12) supported upstanding on edge in the dish-like support
5 (6).

20. An electric heater as claimed in claim 19 characterised in that the first and second terminal regions (12A, 12B) of the at least one electric heating
10 element of corrugated ribbon form (12) are connected directly to the first and second electrically conductive elements (34, 40) and have an orientation substantially the same as that of the at least one electric heating element (12) as supported in the dish-like support (6).

15

21. An electric heater as claimed in claim 19, characterised in that the first and second terminal regions (12A, 12B) of the at least one electric heating element of corrugated ribbon form (12) are connected
20 directly to the first and second electrically conductive elements (34, 40) and are twisted through an appropriate angle for connection to the first and second electrically conductive elements (34, 40).

25 22. An electric heater as claimed in any preceding claim, characterised in that the first and second electrically conductive elements (34, 40) comprise metal.

23. An electric heater as claimed in claim 22,
30 characterised in that the metal is selected from stainless steel and nickel-plated steel.

24. An electric heater as claimed in any preceding claim, characterised in that the first electrically
35 conductive element is electrically connected to the at

least one switch means (18) in the housing (16) and the second electrically conductive element is adapted for electrical connection to an external lead wire.

5 25. An electric heater as claimed in any preceding claim, characterised in that at least a third electrically conductive terminal (24) is provided at a side selected from the first and second sides (32, 38) of the housing (16).

10

26. An electric heater as claimed in claim 25, characterised in that the at least third electrically conductive terminal (24) is arranged for electrical connection to the at least one switch means (18) in the
15 housing (16).

27. An electric heater as claimed in claim 25 or 26, characterised in that the at least third electrically conductive terminal (24) is arranged for electrical
20 connection to an external lead wire.

28. An electric heater as claimed in any preceding claim, characterised in that the housing (16) of the temperature-limiting device (14) comprises ceramic
25 material.

29. An electric heater as claimed in any preceding claim, characterised in that the thermally responsive bimetallic means (22) is thermally coupled with the
30 heater (2) by means of an elongate thermally conductive member (26) which is adapted to extend from the housing (16) at least partly across the heater (2) and overlying the at least one heating element (12).

30. An electric heater as claimed in claim 29, characterised in that the elongate member (26) is of metal.

5 31. An electric heater as claimed in claim 29 or 30, characterised in that the elongate member (26) is of a form selected from rod, beam and tube form.

32. An electric heater as claimed in any one of claims
10 29 to 31, characterised in that the elongate member (26) has an end (28) thereof in direct contact with the bimetallic means (22).

33. An electric heater as claimed in any one of claims
15 29 to 31, characterised in that the elongate member (26) has an end (28) thereof in indirect contact with the bimetallic means (22).

34. An electric heater as claimed in any one of claims 1
20 to 28, characterised in that the housing (16) has a front face (30) thereof adapted to be exposed to thermal radiation from the heater (2), through an aperture (54) provided in a rim of the dish-like support (6), the bimetallic means (22) being adapted to be directly
25 exposed to the thermal radiation from the heater (2).

35. An electric heater as claimed in any one of claims 1
to 28, characterised in that the housing (16) has a front
face (30) thereof adapted to be exposed to thermal
30 radiation from the heater (2), through an aperture (54) provided in a rim of the dish-like support (6), the bimetallic means (22) being in thermo-conducting relationship with thermally conducting means directly exposed, at the front face (30) of the housing (16), to
35 the thermal radiation from the heater (2).

36. An electric heater as claimed in claim 34 or 35, characterised in that the housing (16) is adapted to be partly inserted into the heater (2) through the aperture (54) provided in the rim of the dish-like support (6).

5

37. An electric heater as claimed in any preceding claim, characterised in that the bimetallic means (22) comprises a snap disc (22), operating at a predetermined temperature to displace electric contacts of the at least one switch means (18).

38. An electric heater as claimed in claim 37, characterised in that the snap disc (22) operates to displace the electric contacts by way of an intermediate member (24).

39. An electric heater as claimed in claim 38, characterised in that the intermediate member (24) is of rod form.

20

40. An electric heater as claimed in any one of claims 1 to 36, characterised in that the bimetallic means (22) comprises a member which undergoes increasing deflection with increasing temperature and operates to cause displacement of electric contacts of the at least one switch means (18) at a predetermined temperature.

41. An electric heater as claimed in claim 40, characterised in that the member which undergoes increasing deflection with increasing temperature is of strip form.

42. An electric heater as claimed in claim 40 or 41, characterised in that the electric contacts are incorporated in a snap switch arrangement.

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